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Very significant were the investigations by Yu. V. Solov'yeva, N. A. Kravchenko, and T. V. Volina, who established the capacity of erythrin to neutralize the diphtheria toxin when it is in direct contact with the latter. They also found that erythrin suppresses the formation of diphtheria toxin by the diphtheria bacilli. Insignificant concentrations of erythrin (0.1-0.3 mg in 100 cc) considerably reduce and totally stop the formation of toxin, while concentrations which are higher by a factor of several scores are necessary to suppress propagation of the bacilli.

Work by Yu. V. Solov'yeva, N. A. Kravchenko, and B. V. Zhiv demonstrated that the presence of saliva or pus does not interfere with the action of erythrin. Extensive investigations on erythrin were carried out at the Leningrad Institute imeni Pasteur by A. R. Konova. She submitted to investigation scores of diphtheria cultures and a number of series of erythrin and established the high antibiotic activity of the latter. As far as the mechanism of this antibiotic action is concerned, L. A. Popova demonstrated that erythrin suppresses the action of dehydrogenases in bacteria which are sensitive to it.

L. M. Yakobson has tested erythrin on monkeys after infecting their eyes with diphtheria. When the diseased condition became pronounced, the eyes were treated with erythrin. Yu. V. Solov'yeva has carried out analogous experiments on the eyes of guinea pigs. The results obtained in all of these experiments were excellent. In almost all cases the eyes were brought back to a normal condition by the application of erythrin. In the control guinea pigs not treated with erythrin, the infection with diphtheria resulted in destruction of the eye in almost every instance, and half of the animals died from diphtheria.

Because erythrin is a high-molecular substance which does not diffuse easily into the tissues, it was utilized chiefly for local application, i.e., for treating the oral and nasopharynx cavity of diphtheria patients and carriers of diphtheria bacilli. During a number of years erythrin was thoroughly investigated at Professor A. I. Dobrokhotova's clinic at the Pediatric Institute, Academy of Medical Sciences USSR.

Veys investigated the action of erythrin on more than 300 patients. Of these patients 56% had diphtheria of the pharynx, among them 16% of toxic types, 13% nasal diphtheria, and 22% combined forms of the infection. All patients received antidiphtheria serum on the basis of the usual medical indications and, in addition, erythrin. Patients who received antidiphtheria serum only were used as controls.

Erythrin was found to reduce considerably the duration of the local inflammatory process. The clearing of the pharynx, which was slow and gradual in the control cases, assumed a precipitate character with erythrin. The liberation of the pharynx from diphtheria bacilli was also considerably expedited. In 8 days 85% of the patients were permanently freed from diphtheria bacilli. To evaluate this figure one must remember that, according to Professor Molchanov's data, only 2% of the patients are normally freed from bacteria bacilli within one week after recovery. As mentioned above, the serum was administered to the patients in accordance with their condition. When the quantity of serum which was administered to patients treated with erythrin was computed and compared with that given to patients who were not treated with erythrin (the type of disease being the same in either case), it was found that the latter had received two-three times more serum.

A considerable amount of data on the action of erythrin was also accumulated by M. M. Budzhe at the Infectious Diseases Clinic of the Medical Faculty, University of Latvia. This author observed 307 patients, of whom 177 were treated with erythrin and 130 served as controls. Rapid disappearance of films and of diphtheria bacilli was also observed here in the case of patients treated with erythrin. Thus, in patients treated with erythrin during 8 days, bacilli

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were found only in 4.9% of the cases, while in the control group (patients treated with serum only) 30.3% of the patients had diphtheria bacilli. The incidence of complications was three times lower in the group treated with erythrin. Good results on application of erythrin were also obtained by Krechetova and others.

Extensive work has also been done on the decontamination with erythrin of diphtheria-bacillus carriers. Results obtained by Yakobson, Danilevich, Kochetova, et al., indicate that erythrin is undoubtedly effective in this respect. These investigators found that a 5-day treatment with erythrin decontaminated 55-75% of the bacillus carriers, a 15-day treatment decontaminated 75-90%, and that in the majority of cases the decontamination was lasting. These results were obtained under application of 0.5% solutions of erythrin. Lately, a 5% erythrin salve was introduced into practice and was found to be still more effective.

One must emphasize that erythrin must be applied according to a precise method. When a direct and sufficiently prolonged contact with the affected tissue has been achieved, a positive effect is certain. Difficulties arise when the chronic inflammatory process in the nasopharynx prevents the substance from penetrating into tissue folds which harbor diphtheria bacilli. But even in these neglected cases an effect can be achieved, particularly when an erythrin salve is used.

The Scientific Medical Council of the Ministry of Public Health USSR gave exhaustive consideration to all then available results on erythrin, both positive and negative (the latter obtained by Titov), as early as 23 February 1948, and decided on the basis of clinical results that this substance must be regarded as effective against diphtheria. The council also decided that it should be extensively introduced into medical practice for the local therapy of diphtheria in conjunction with serum therapy as well as for the treatment of diphtheria-bacillus carriers. This decision was confirmed by Ye. I. Smirnov, Minister of Public Health USSR.

Thus, erythrin has been introduced into Soviet medicine after a thorough investigation. Instead of blindly searching for antibiotics in various substrates, we can now systematically investigate tissues which are resistant to definite bacteria and viruses. It is obvious now that antibiotics contained in various tissues are one of the factors that produce immunity. If we learn how to extract them from tissues, our medicine will be enriched with new antibiotics.

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